African Journal of Virology Research ISSN 3421-7347 Vol. 4 (5), pp. 001-012, May, 2010. Available online at www.internationalscholarsjournals.org © International Scholars Journals

Full length Research paper

Effect of seed treatments on disease incidence, seed quality, seed yield, stick yield and fibre yield following line sowing method in CVL-1 variety

S. M. A. Haque[1], I. Hossain[2] and M. A. Rahman[2]

[1]Senior Scientific Officer, Plant Pathology Department, Pest Management Division, Bangladesh Jute Research Institute, Dhaka-1207, [2] Professor, Department of Plant Pathology, Bangladesh Agricultural University, Mymensingh.

Accepted 18 April, 2008

The present study was conducted to clarify the jute seed storage sustainability using biological agent. The experiments were conducted in the field of JAES and KRS of BJRI and conducted during the period April 2012 to January 2013. Two different seed treatments viz. Provax-200 and BAU- Biofungicide and Seeds having moisture content 9.5% were used for the experiment. Disease incidence occurred lowest at JAES and KRS with BAU- Biofungicide treated seeds were used. BAU- Biofungicide and Provax-200 showed superior means for controlling field fungi with higher seed yield and better improvement of seed quality. The highest disease incidences 20.32% and lowest disease incidences 6.37% were recorded under control and BAU- Biofungicide treated seeds, respectively. Negative relations between disease severity and seed yield, fibre yield and stick yield were observed in seed treatments with BAU- Biofungicide and Provax-200. The highest seed yield (619.58 kg/ha), fibre yield (4.79 ton/ha) and stick yield (10.54 ton/ha) were recorded under BAU- Biofungicide treated seeds and lowest seed yield (461.81 kg/ha), fibre yield (2.87 ton/ha) and stick yield (6.08 ton/ha) were recorded under control treatment. Thus, seed treatment by BAU- Biofungicide enhanced the quality and yield of the jute seed and fibre in the field.

Key Word: Effect, seed treatment, disease incidence, quality, yield, CVL-1.

Abbreviations

JAES- Jute Agricultural Experimental Station
KRS- Kishoregonj Regional Station BJRI-
Bangladesh Jute Research Institute NATP-
National Agricultural Training Project

INTRODUCTION

Jute is one of the major cash crops and mainstay of Bangladesh economy. It accounts for about 6% of the foreign currency earnings from exports (Islam, 2009). Its influence on ecology and economy is so intimate that it's the effects are significantly related to the agro-ecology and the socio-economic life of the people. Jute crop is also cultivated in different countries. The crop is versatile and environmental friendly biodegradable natural fibre widely grown in Asia, particularly in Bangladesh, India and China. Among the jute growing countries of the world, Bangladesh ranks second in respect of production (Islam, 2007). The land and climatic conditions of Bangladesh are congenial for the production of high quality jute. In Bangladesh, about 0.709 million hectares of land was under jute cultivation and the total yield was 8.40 million bales (BBS, 2011; IJSG website, 2012-13). As per Khandakar (1987), Bangladesh annually needs about 4000 metric tons of jute seeds of which only 12-15% is produced and supplied by the Bangladesh Agricultural Development Corporation (BADC). The rest of the seeds, about 85% or more of the

*Correspondence author E-mail: upolbjri@gmail.com

Table1. Soil characteristics and nutrient status of the two experimental locations in 2012.

Experimental location	AEZ	Soil characteristics		Nutrient status				
		Land type	Soil type	pH	% OM	% N	P (ppm)	K (meq/100)
Jute Agriculture Experimental Station (JAES), Manikgonj, BJRI	Active Brahmaputra and Jamuna Flood Plain (AEZ-7)	Medium land	Sandy and Silty	6.69	1.79	0.35	14.38	0.138
Kishoregonj Regional Station (KRS), BJRI	Old Brahmaputra Flood Plain (AEZ-9)	Medium land	Loam	6.11	1.24	0.39	14.98	0.15

requirement, are produced and managed by farmers' (Hossain et al., 1994). Jute suffers from more than 13 different diseases (Fakir, 2001) and 10 of them are seed borne. Sowing of infected seeds may cause the death of seedlings and often plants escaping early infection succumb to death due to different diseases. Seed germination decreases with the increase of the seed borne infection. Seeds having higher seed borne infection results to significantly higher amount of disease development in the field. The rate of transmission of these pathogens from infected seeds to the growing plants and finally to the harvested seeds was relatively low (Fakir and Islam, 1990). Among the seed-borne fungal diseases, stem-rot, black-band, and anthracnose caused by *Macrophomina phaseolina* (Tassi, Goid.), *Botryodiplodia theobromae* and *Colletotrichum corchori* (Ikata and Yoshida, 1940), respectively are frequently transmitted through jute seeds. These findings corroborate the findings by earlier workers (Fazli and Ahmed, 1960; Ahmed, 1966; Fakir et al., 1991). *Macrophomina phaseolina* alone can cause 10% yield loss (Ahmed, 1968). Stem rot, black band, anthracnose, foot rot and wilt (*Rhizoctonia solani*) and leaf mosaic (virus) are responsible for seed rot, pre and post emergence damping off seedlings, spread of the diseases to standing crops and loss and deterioration of quality of fibre (Ahmed, 1966, 1968; Ahmed and Islam, 1980; Biswas et al., 1985). Soft rot, foot rot and wilt caused by *Sclerotium rolfsii* and *Rhizoctonia solani*, respectively also cause considerable yield losses to the crop. *Fusarium* spp. (*Fusarium semitectum* and *Fusarium oxysporum*), *Curvularia lunata* and *Phomopsis* sp. are responsible for causing germination failure and seed rot (Fazli and Ahmed, 1960). Yield loss due to seed borne diseases of jute is 8-20% depending on the severity of jute diseases from year to year (Ahmed and Sultana, 1985). Infected jute seed fail to germinate or the young seedlings emerging from the infected seed die. Infection of jute seed causes germination failure, post emergence damping off and seedling blight (Fakir, 1989). Jute seedlings or growing plants produced in the field from the infected seeds and escaping early infection may often be infected at the later stages of their growth by the primary seed borne inocula grown and multiplied on the infected dead seeds and seedlings. Later on, these inocula may be transmitted to the healthy growing plants of the same or neighboring plants or even neighboring fields resulting to disease outbreak, often in epidemic form. Seed borne pathogens causing diseases on the growing jute plants in the field quite often attack the capsules or pods and subsequently infect the seed, resulting to production of infected or unhealthy seeds. Therefore, proper disease control measure should be taken for the production of quality jute seeds. Considering the above facts, the present study was carried out to find out suitable seed management for quality jute seeds and fibre production.

MATERIALS AND METHODS

Experimental sites and period

The experiments were conducted in the field of Jute Agriculture Experimental Station (JAES), Manikgonj and Kishoregonj Regional Station (KRS), Kishoregonj of BJRI. The experiments were conducted during the period April 2012 to January 2013.

Varieties used

Seed of CVL-1 was used in this study.

Moisture content of seeds

Seeds having moisture content 9.5% (Khandakar and Bradbeer, 1983; Bangladesh Gazette, 2010) was selected for field study.

Seed Management

Seed treated with Provax-200 WP (0.4% of seed weight)

Seeds were treated with Provax-200 (5,6- dihydro -2-methyl-1, 4-oxathin-3- carboxinilide, Group: Oxathin) @ 0.4% of seed weight in a 250 ml Erlenmeyer flask and shaken thoroughly for proper coating of the seeds with the fungicides (Anon., 2001).

Seed treated with BAU- Bio fungicide @ 3% of seed weight (Hossain, 2011b)

Seeds were treated with BAU- Biofungicide @ 3% of seed weight in a 250 ml Erlenmeyer flask and shaken thoroughly for proper coating of the seeds. The treated seeds were kept inside the brown paper bags so that seeds remain in dry condition till for further use.

iii) Control (Untreated)

Experimental design

The experiments were conducted following Randomized Block Design (RCBD) having three replications. The size of the unit plot was $10m^2$ (5m x 2m) and the distance between plots and replications were 1.0 m and 1.0 m, respectively.

Soil characteristics and nutrient status

The Soil characteristics and nutrient status of the two experimental stations (JAES, Manikgonj and KRS, Kishoregonj) are shown in Table 1.

Land preparation

The land was first opened on 13 March 2012 with a power tiller. Final land preparation was done by tractor drawn disk plough and thoroughly prepared with four ploughings and three cross ploughings followed by ladderings in order to level the soil. Weeds and stubbles were removed from the field. Finally, individual plots were prepared by using spades before sowing of seeds.

Application of fertilizers

During final land preparation Urea 60 kg, Triple Super Phosphate 50 kg and Muriate of Potash 25 kg per hectare were applied (Islam, 2009; Islam et al., 2008). After 15-20 days of seed germination first top dressing with the urea @ 60 kg and again another 15 days later of first top dressing, the 2nd top dressing was given with 60 kg per hectare. Top dressing of urea was done very carefully so that it will not come in contact with the plant parts. To meet sulphur and zinc deficiency, gypsum and zinc oxide @ 45 kg and 5 kg per hectare were applied (Islam, 2009; Islam et al., 2008).

Sowing of seeds

Seeds were sown in line on 18 April, 2012 in Kishoregonj Regional Station (KRS), Kishoregonj and 30 April in Jute Agriculture Experimental Station (JAES), Manikgonj. Row to row and plant to plant distance were maintained as 1M and 1 M, respectively. The seed rate for CVL-1 was 5 kg per hectare.

DATA COLLECTION

Data on different parameters were collected as shown below

1. Field emergence (germination %)

Four hundred seeds were taken randomly from the well mixed seed samples. The working samples were divided into four replications and thus one replication contains 100 seeds. To ensure adequate spacing, the seeds were germinated on soil in experimental plots. Seeds were counted as germinating seeds after four days. The results were expressed in percentages.

2. Plant stand/ plant population
3. Incidence of diseases (%)
4. Plant height (M)
5. Base diameter (mm)
6. Fibre yield per plant (gm) and hectare (ton)

Fibre was harvested at a field duration of 120 days from the jute plants grown in different blocks. The crop was harvested after 120 days of sowing. After being harvested, bundles of plants were to leave in a heap in dry jute field for four days to make defoliation. Fibre yield per plant and hectare were recorded.

7. Stick yield per plant (gm) and per hectare (ton)

Stick was harvested from the jute plants grown in different blocks. Stick yield per plant and hectare were recorded.

8. Average number of branch per plant
9. Average number of fruits per plant

The ripening pods (65-75%) were harvested from the jute plants grown in different blocks as per different seed production methods. Seeds were extracted from the harvested pods, dried and seed yield per plant and hectare were recorded.

10. Seed yield per plant (gm) and per hectare (kg)

The ripening pods (65-75%) were harvested from the jute plants. Seeds were extracted from the harvested pods, dried and seed yield per plant and hectare were recorded.

11. Weight of 1000- seeds (gm)

For weight determination the thousand seeds of jute was randomly counted for each pure seed sample and measured in an electronic balance (Model- PC- 180). Some plots were kept on harvested for seed production

STATISTICAL ANALYSIS

Data were analysed statistically and treatments effects were compared by Duncan's Multiple Range Test (DMRT). Relation between seed borne fungal pathogens and germination was observed with regression equations.

Table 2. Effect of seed treatments on disease incidence in CVL-1 at JAES and KRS, BJRI following line sowing method in the field.

Containers	% Major disease incidence recorded in																	
	JAES									KRS								
	Seedling blight	Stem rot	Black band	Anthracnose	Die back	Soft rot	Mosaic	Root knot	Total disease	Seedling blight	Stem rot	Black band	Anthracnose	Die back	Soft rot	Mosaic	Root knot	Total disease
T_1	0.00	1.58 c	1.00 c	0.83	1.08 c	0.30 b	2.25 b	1.90 b	8.94 c	0.92 b	0.84 b	0.75 b	0.19 b	0.13 c	0.00	0.96 b	0.00	3.79 c
	(0.71)	(1.44)	(1.22)	(1.15)	(1.26)	(0.89)	(1.66)	(1.55)	(3.07)	(1.19)	(1.16)	(1.12)	(0.83)	(0.79)	(0.71)	(1.21)	(0.71)	(2.07)
T_2	0.00	2.00 b	1.55 b	1.05	2.42 b	1.20 a	3.56 a	2.28 b	14.06 b	1.31 b	1.03 b	1.25 b	0.42 a	1.14 b	0.00	1.00 b	0.00	6.15 b
	(0.71)	(1.58)	(1.43)	(1.24)	(1.71)	(1.30)	(2.01)	(1.67)	(3.82)	(1.35)	(1.24)	(1.32)	(0.96)	(1.28)	(0.71)	(1.22)	(0.71)	(2.58)
T_3	0.00	3.67 a	3.66 a	1.33	3.35 a	1.28 a	4.05 a	3.68 a	21.02 a	3.26 a	3.98 a	3.88 a	0.53 a	3.33 a	0.00	4.63 a	0.00	19.61 a
	(0.71)	(2.04)	(2.04)	(1.35)	(1.96)	(1.33)	(2.13)	(2.04)	(4.64)	(1.94)	(2.12)	(2.09)	(1.01)	(1.96)	(0.71)	(2.26)	(0.71)	(4.48)
Level of significance	NS	0.05	0.05	NS	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	NS	0.05	NS	0.05

T_1= Seed treated with BAU- Biofungicide (3%), T_2= Seed treated with Provax-200 (0.4%), T_3 = Control (Untreated) JAES = Jute Agriculture Experimental Station (JAES), Manikgonj, KRS = Kishoregonj Regional Station (KRS), BJRI
Figures in parentheses indicate the transformed values
Data in column having common letter(s) do not differ significantly at 5% level of significance.

Relationships between disease severity and seed, fibre and stick yield were also observed by linear regression lines and equations (Gomez and Gomez, 1984).

RESULTS AND DISCUSSION

Disease incidence in CVL-1 at JAES and KRS, BJRI

Altogether eight diseases (seedling blight, stem rot, black band, anthracnose, die back, soft rot, mosaic and root knot) of CVL-1 were recorded. Total as well as individual disease incidence varied independently of each other with respect to different types of storage containers, variety and locations (Table 2). Seedling blight was recorded up to one month age of the plants. Seedling blight was not found at JAES and root knot was not found at KRS depending soil characteristics and weather condition. Prevalence of total disease incidence ranged from 8.94 to 21.02% and 3.79 to 19.61% at JAES and KRS, respectively (Table 2). Highest stem rot (3.98%), black band (3.88%) and mosaic (4.63%) were recorded under control condition at KRS. The highest total disease incidence (21.02%) at JAES was recorded under control treatment. Whereas the lowest total disease incidence (3.79%) at KRS was recorded in BAU- Biofungicide treated seed. BAU- Biofungicide and Provax-200 have been recorded as superior means for controlling seed borne fungi as well as field fungi with higher seed yield and better improvement of seed quality. These findings corroborate earlier workers.

(Hossain, 2011a; Hossain, 2010; Hossain et al,. 2009; Mostafa, 2009; Hossain and Sarker, 2008; Islam and Biswas, 1981; Khan and Fakir, 1993; Haque et al., 1999). Fakir (2001) also reported that jute suffered from more than 12 different diseases of which major pathogens viz. *Macrophomina phaseolina*, *Botryodiplodia theobromae* and *Colletotrichum corchori* were responsible for stem rot, black band and anthracnose, respectively and found most widely distributed in the country. Fakir et al. (1991, 1993) reported that each of these three pathogens reduced the yield of jute seed drastically. All these reports are in consonance with the present findings.

Table 3. Effect of seed treatments on field emergence (germination),plant stand, plant height and base diameter in CVL-1 at JAES and KRS, BJRI following line sowing method in the field.

Treatments	% Field emergence			Number of plant/m^2			Plant height (M)			Base diameter (mm)		
	JAES	**KRS**	**Mean**	**JAES**	**KRS**	**Mean**	**JAES**	**KRS**	**Mean**	**JAES**	**KRS**	Mean
T_1	75.00	74.89 a	74.95	4.93 a	5.19 a	5.06 a	2.85	3.03	2.94	19.42	17.63 a	18.54
T_2	72.36	73.38 ab	72.87	4.21 ab	4.20 ab	4.21 ab	2.75	3.00	2.88	18.63	16.22 b	17.43
T_3	70.56	71.31 b	70.93	3.34 b	3.41 b	3.38 b	2.65	2.95	2.80	18.53	15.90 b	17.22
Level of significance	NS	0.05	NS	0.05	0.05	0.05	NS	NS	NS	NS	0.05	NS

T_1= Seed treated with BAU- Biofungicide (3%), T_2= Seed treated with Provax-200 (0.4%), T_3 = Control (Untreated), JAES = Jute Agriculture Experimental Station (JAES), Manikgonj, KRS = Kishoregonj Regional Station (KRS), BJRI.
Data in column having common letter(s) do not differ significantly at 5% level of significance.
NS = Not significant.

Effect of seed treatments on field emergence (germination), plant stand, treatment. The highest mean plant height (2.94 M) and lowest mean plant height **plant height and base diameter in CVL-1 at JAES and KRS, BJRI following** (2.80 M) of two locations were recorded under BAU- Biofungicide treated seed **line sowing method in the field** and control treatment, respectively. Highest base diameter (19.42 mm) at JAES was recorded under BAU- Biofungicide treated seed and the lowest base

Different types of seed treatments differed significantly in respect of seed diameter (15.90 mm) at KRS was recorded under control condition. The highest germination, plant stand, plant height and base diameter in CVL-1 grown at JAES mean base diameter (18.54 mm) and lowest mean base diameter (17.22 mm) of and KRS of (Table 3). The highest germination (75.00%) of CVL-1 was recorded two locations were recorded under BAU- Biofungicide treated seed and control under BAU- Biofungicide treated seed at JAES and lowest germination (70.56%) condition, respectively (Table 3). The present findings revealed that seed quality at JAES was recorded under control condition. The highest mean germination was comparatively better in case of using BAU- Biofungicide and Provax-200 (74.95%) and lowest mean germination (70.93%) of two locations were recorded treated seeds as well as seed borne infection of fungal pathogens were less in under BAU- Biofungicide treated seed and control condition, respectively. The seeds produced with BAU- Biofungicide and Provax-200 treated seeds. Moreover, highest total number of plant/m^2 (5.19) at KRS and lowest number of plant/m^2 seed treatments increased germination with the decrease of total seed borne (3.34) at JAES were recorded under BAU- Biofungicide treated seed and control fungal pathogens. Similarly, Akanda and Fakir (1985) recorded low germination of condition, respectively. The highest mean total number of plant/m^2 (5.06) and jute seeds having high seed borne fungal pathogens. Hossain (2011a) reported lowest mean total number of plant/m^2 (3.38) of two locations were recorded under that BAU- Biofungicide (3%) was found to control the seed borne pathogens and BAU- Biofungicide treated seed and control condition, respectively. The highest also increased the germination percentage of seeds. Similar result was also plant height (3.03 M) was recorded under BAU– bio fungicide treated seed at reported by (Yeasmin et al., 2009; Shultana et al., 2009; Bhuiyan et al., 2006). KRS. The lowest plant height (2.65M) at JAES was recorded under control The low germination in control was related to high prevalence of seed borne

Table 4. Effect of seed treatments on branch and capsule per plant in CVL-1 at JAES and KRS, BJRI following line sowing method in the field.

Treatments	Number of branch/plant			Number of capsule/plant		
	JAES	KRS	Mean	JAES	KRS	Mean
T_1	5.78 a	5.13 a	5.46	71.61 a	78.65 a	75.13 a
T_2	5.39 b	4.58 ab	4.99	67.83 b	64.55 b	66.19 b
T_3	5.06 b	4.25 b	4.66	49.28 c	48.32 c	48.80 c
Level of significance	0.05	0.05	NS	0.05	0.05	0.05

T_1= Seed treated with BAU- Biofungicide (3%), T_2= Seed treated with Provax-200 (0.4%), T_3 = Control (Untreated) JAES = Jute Agriculture Experimental Station (JAES), Manikgonj, KRS = Kishoregonj Regional Station (KRS), BJRI
Data in column having common letter(s) do not differ significantly at 5% level of significance.
NS = Not Significant

Table 5. Effect of seed treatments on fibre and stick yield per plant and hectare in CVL-1 at JAES and KRS, BJRI following line sowing method in the field.

Treatments	Fibre yield (gm/plant)			Stick yield (gm/plant)			Fibre yield (t/ha)			Stick yield (t/ha)		
	JAES	KRS	Mean	JAES	KRS	Mean	JAES	KRS	Mean	JAES	KRS	Mean
T_1	12.72	11.50	12.11	22.22	20.93 a	21.58	4.79 a	3.95	4.37 a	10.54 a	9.14 a	9.84 a
T_2	11.53	11.17	11.35	21.39	20.83 a	21.11	3.99 ab	3.65	3.82 a	9.36 a	8.36 a	8.86 a
T_3	11.50	10.67	11.09	21.11	19.44 b	20.28	3.18 b	2.87	3.03 b	7.12 b	6.08 b	6.60 b
Level of significance	NS	NS	NS	NS	0.05	NS	0.05	NS	0.05	0.05	0.05	0.05

T_1= Seed treated with BAU- Biofungicide (3%), T_2= Seed treated with Provax-200 (0.4%), T_3 = Control (Untreated) JAES = Jute Agriculture Experimental Station (JAES), Manikgonj, KRS = Kishoregonj Regional Station (KRS), BJRI
Data in column having common letter(s) do not differ significantly at 5% level of significance.
NS = Not Significant

fungal infections. Genetic performances in jute varieties and climatic variation in locations might be responsible for variation in seed quality, seed yield and seed borne infection of fungal pathogens. Haque et al. (1999) reported that seed germination varied significantly with respect to variety, seed category and location of seed collection.

Effect of seed treatments on number of branch and capsule per plant in CVL-1 at JAES and KRS, BJRI following line sowing method in the field

Different types of seed treatments differed significantly in respect of number of branch and capsule per plant in both CVL-1 grown at JAES and KRS of

Table 6. Effect of seed treatments on seed yield per plant and hectare in CVL-1 at JAES and KRS, BJRI following line sowing method in the field.

Treatments	Seed yield (gm/plant)			Seed yield (kg/ha)		
	JAES	KRS	Mean	JAES	KRS	Mean
T_1	5.46	4.98	5.22 a	619.58	536.25 a	577.92 a
T_2	5.27	4.75	5.01 ab	602.12	502.21 b	552.17 a
T_3	4.88	4.66	4.77 b	482.25	461.81 c	472.03 b
Level of significance	NS	NS	0.05	NS	0.05	0.05

T_1= Seed treated with BAU- Biofungicide (3%), T_2= Seed treated with Provax-200 (0.4%), T_3 = Control (Untreated)
JAES = Jute Agriculture Experimental Station (JAES), Manikgonj, KRS = Kishoregonj Regional Station (KRS), BJRI Data in column having common letter(s) do not differ significantly at 5% level of significance. NS = Not Significant

Table 7. Effect of seed treatments on 1000-seed weight in CVL-1 at JAES and KRS, BJRI following line sowing method in the field.

Treatments	1000- seed weight (gm)		
	JAES	**KRS**	**Mean**
T_1	3.28	3.25	3.27 a
T_2	3.25	3.19	3.22 ab
T_3	3.20	3.16	3.18 b
Level of significance	NS	NS	0.05

T_1= Seed treated with BAU- Biofungicide (3%), T_2= Seed treated with Provax-200 (0.4%), T_3 = Control (Untreated)
JAES = Jute Agriculture Experimental Station (JAES), Manikgonj, KRS = Kishoregonj Regional Station (KRS), BJRI
Data in column having common letter(s) do not differ significantly at 5% level of significance.
NS = Not Significant

both CVL-1 grown at JAES and KRS of BJRI (Table 4). The highest branch (5.78) of CVL-1 was recorded under BAU- Biofungicide treated seed at JAES and highest capsule/plant (78.65) at KRS was recorded under BAU- Biofungicide treated seed. The lowest branch (4.25) and capsule/plant (48.32) at KRS were recorded under control condition. The highest mean branch (5.46) and capsule/plant (75.13) of two locations were recorded under BAU- Biofungicide treated seed. The lowest mean branch (4.66) and capsule/plant (48.80) of two locations were recorded under control treatment.

Effect of seed treatments on fibre, stick and seed yield per plant and hectare in CVL-1 at JAES and KRS, BJRI following line sowing method in the field

Different types of seed management differed significantly in respect of fibre and stick yield in CVL-1 grown at JAES and KRS of BJRI (Table 5). The highest fibre yield/plant (12.72 gm) and fibre yield/ha (4.79 ton) at JAES were recorded under BAU- Biofungicide treated seed. The lowest fibre yield/plant (10.67 gm) and fibre yield/ha (2.87 ton) at KRS were recorded under control condition. The highest mean fibre yield/plant (12.11 gm) and fibre yield/ha (4.37 ton) of two locations were recorded under BAU- Biofungicide treated seed. Highest stick yield/plant (22.22 gm) and stick yield/ha (10.54 ton) at JAES were recorded under BAU- Biofungicide treated seed. The lowest stick yield/plant (19.44 gm) and stick yield/ha (6.08 ton) at KRS were recorded in control condition. The highest mean stick yield/plant (21.58 gm) and fibre yield/ha (9.84 ton) of two locations was recorded under BAU- Biofungicide treated seed. The highest seed yield/plant (5.46 gm) and seed yield/ha (619.58 kg) at JAES were recorded under BAU- Biofungicide treated seed. The lowest seed yield/plant (4.66 gm) and seed yield/ha (461.81 kg) at KRS were recorded under control condition. The highest mean seed yield/plant (5.22 gm) and seed yield/ha (577.92 kg) of both locations were recorded under BAU- Biofungicide treated seed (Table

Table 8. Interaction effects among the locations and seed treatments in CVL-1 variety on disease incidence, seed quality, seed yield, stick yield and fibre yield following line sowing method in the field.

Interaction among locations and seed treatments	**Percent disease incidence**	**Field emergence (%)**	**Plant stand/m²**	**Plant height (M)**	**Base diameter (mm)**	**Fibre yield (gm/plant)**	**Stick yield (gm/plant)**	**Fibre yield (t/ha)**	**Stick yield (t/ha)**	**Number of branch/ plant**	**Number of capsule/ plant**	**Seed yield (gm /plant)**	**Seed yield (kg/ha)**	**1000-seed weight (gm)**
L_1XT_1	8.94 d	75.00 a	4.93 a	2.85	19.42 a	12.72 a	22.22 a	4.79 a	10.54 a	5.78 ab	71.61 b	5.46	619.58 a	3.28
L_1XT_2	14.06 c	72.36 c	4.21 ab	2.75	18.63 ab	11.53 ab	21.39 b	3.99 ab	9.36 b	5.39 a	67.83 c	5.27	602.12 a	3.25
L_1XT_3	21.02 a	70.56 e	3.34 b	2.65	18.53 ab	11.50 ab	21.11 b	3.18 b	7.12 c	5.06 ab	49.28 e	4.88	482.25 cd	3.20
L_2XT_1	3.79 f	74.89 a	5.19 a	3.03	17.63 b	11.50 ab	20.93 b	3.95 ab	9.14 b	5.13 a	78.65 a	4.98	536.25 b	3.25
L_2XT_2	6.15 e	73.38 b	4.20 ab	3.00	16.22 c	11.17 ab	20.83 b	3.65 ab	8.36 b	4.58 ab	64.55 d	4.75	502.21 c	3.19
L_2XT_3	19.61 b	71.31 d	3.41 b	2.95	15.90 c	10.67 b	19.44 c	2.87 b	6.08 d	4.25 b	48.32 f	4.66	461.81 d	3.16
Level of significance	0.05	0.05	0.05	NS	0.05	0.05	0.05	0.05	0.05	0.05	0.05	NS	0.05	NS

L_1= JAES, Manikgonj, BJRI, L_2 = KRS, Kishoregonj, BJRI
T_1= Seed treated with BAU- Biofungicide (3%)
T_2= Seed treated with Provax-200 (0.4%)
T_3 = Control (Untreated)
Data in column having common letter(s) do not differ significantly at 5% level of significance.
NS = Not significant

6). Islam, 2009; Hossain, 2003; Hossain, 2009 also reported that BAU-Biofungicide had good effect in the increase of yield.

Effect of seed treatments on 1000- seed weight in CVL-1 at JAES and KRS, BJRI following line sowing method in the field

Different types of seed treatments differed significantly in respect of 1000-seed weight in CVL-1 grown at JAES and KRS of BJRI (Table 7). The highest 1000- seed weight (3.28 gm) of CVL-1 was recorded BAU- Biofungicide treated seed at JAES. The lowest 1000- seed weight (3.16 gm) at KRS was recorded under control treatment. The highest mean 1000- seed weight (3.27 gm) and lowest mean 1000- seed weight (3.18 gm) of two locations were recorded under BAU- Biofungicide treated seed and control treatment, respectively.

Interaction effect among the locations and seed treatments on disease incidence, seed quality, seed yield,stick yield and fibre yield following line sowing method in the field

Interaction effect of locations with different types of seed treatments differed significantly for disease incidence, field emergence, number of plant, plant height, base diameter, fibre yield, stick yield, number of branch, number of capsule, seed yield and 1000- seed weight (Table 8). Interaction effect among KRS and seed treated with BAU- Biofubgcide resulted lower disease incidence (3.79%). The highest disease incidence (21.02%) was encountered in case of interaction among JAES and control condition. Interaction effect between locations, different types of seed treatments on germination was found significant (Table 8).But there was no significant differences among L_1XT_1 (75.00%) and L_2XT_1 (74.89%).

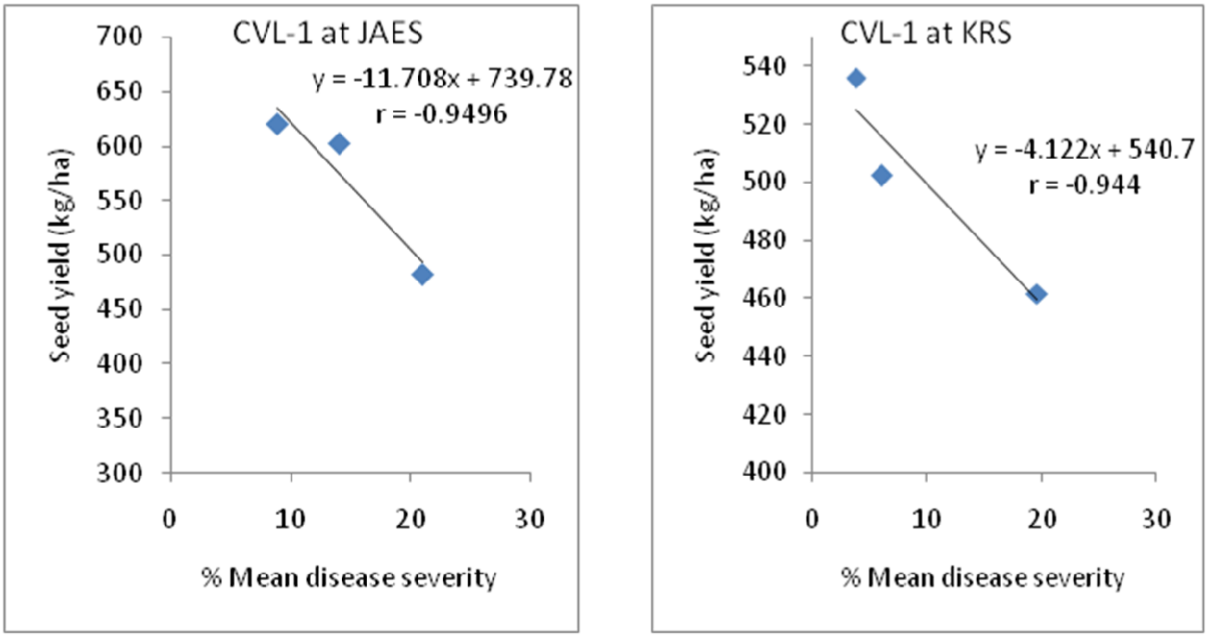

Figure 1. Relationship of mean disease severity (%)with seed yield (kg/ha) of CVL-1 with seed treatments at JAES and KRS, BJRI following line sowing method in the field.

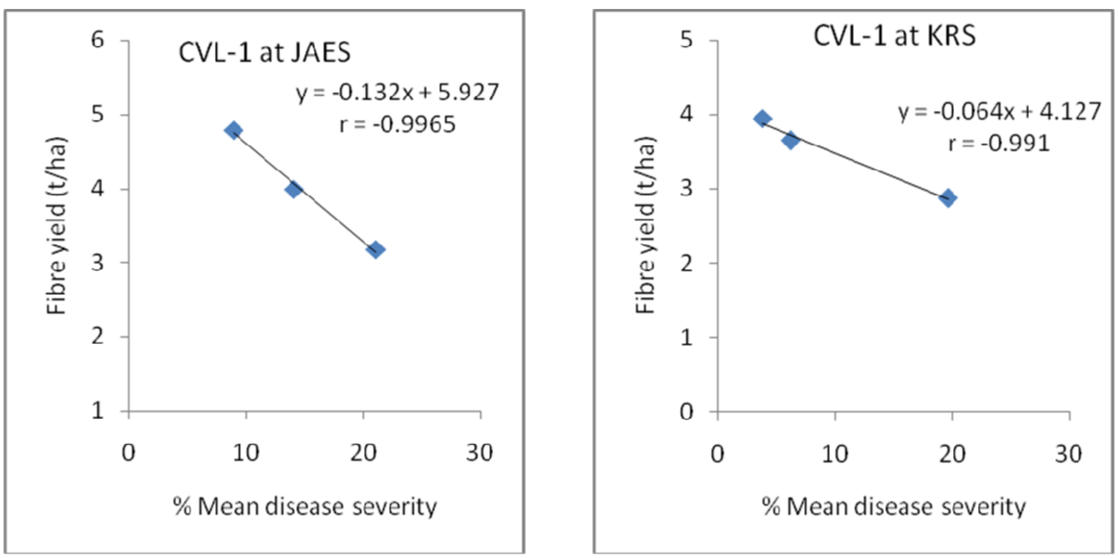

Figure 2. Relationship of mean disease severity (%) with fibre yield (ton/ha) of CVL-1 with seed treatments at JAES and KRS, BJRI following line sowing method in the field.

The highest result was found in L_1XT_1 (75.00%) followed by L_2XT_1 (74.89%). The lowest result was found in L_1XT_3 (70.56%) preceded by L_2XT_3 (71.31%). Interaction effect between locations, different types of seed treatments on plant stand/m^2 were found significant. But there was no significant differences among L_1XT_1 (4.93), L_1XT_2 (4.21), L_2XT_1 (5.19) and L_2XT_2 (4.20). Again there was no significant variation among L_1XT_2 (4.21), L_1XT_3 (3.34), L_2XT_2 (4.20) and L_2XT_3 (3.41). The highest result was found in L_2XT_1 (5.19) followed by L_1XT_1 (4.93). The lowest result was found in L_1XT_3 (3.34) preceded by L_2XT_3 (3.41). Interaction effect between locations, different types of seed treatments on plant height were found no significant. The highest result was found in L_2XT_1 (3.03 M) followed by L_2XT_2 (3.00 M). The lowest result was found in L_1XT_3 (2.65 M) preceded by L_1XT_2 (2.75 M). In cases of base diameter there were no significant differences among L_1XT_1 (19.42 mm), L_1XT_2 (18.63 mm) and L_1XT_3 (18.53 mm). The highest result was found in L_1XT_1 (19.42 mm) and lowest result was found in L_2XT_3 (15.90 M). Interactions effects between locations, different types of seed treatments on fibre yield/ha were

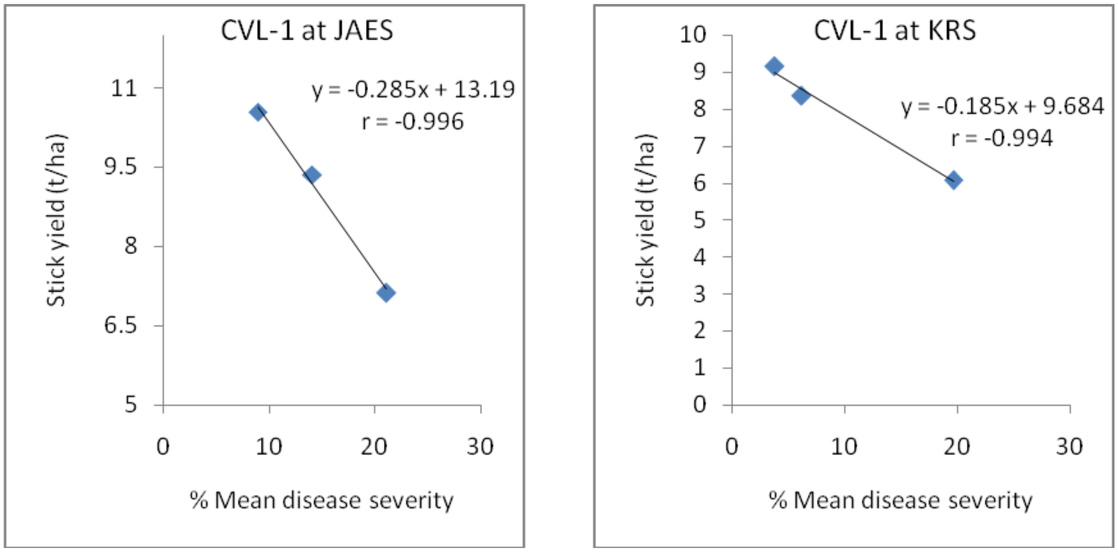

Figure 3. Relationship of mean disease severity (%) with stick yield (ton/ha) of CVL-1 with seed treatments at JAES and KRS, BJRI following line sowing method in the field

found significant. But there was no significant differences among L_1XT_1 (4.79 ton), L_1XT_2 (3.99 ton), L_2XT_1 (3.95 ton) and L_2XT_2 (3.65 ton). Again there was no significant variation among L_1XT_2 (3.99 ton), L_1XT_3 (3.18 ton), L_2XT_1 (3.95 ton), L_2XT_2 (3.65 ton) and L_2XT_3 (3.87 ton). The highest result was found in L_1XT_1 (4.79 ton) followed by L_1XT_2 (3.99 ton). The lowest result was found in L_2XT_3 (2.87 ton) preceded by L_1XT_3 (3.18 ton). Interaction effect between locations, different types of seed treatments on stick yield/ha were found significant. But there was no significant differences among L_1XT_2 (9.36 ton), L_2XT_1 (9.41 ton) and L_2XT_2 (8.36 ton). The highest result was found in L_1XT_1 (10.54 ton) followed by L_1XT_2 (9.36 ton). The lowest result was found in L_2XT_3 (6.08 ton) preceded by L_1XT_3 (7.12 ton). Interactions effects between locations, different types of seed treatments on seed yield/ha were found significant. But there was no significant differences among L_1XT_1 (619.58 kg) and L_1XT_2 (602.12 kg). Again there was no significant variation among L_1XT_3 (482.25 kg) and L_2XT_3 (461.81 kg). The highest result was found in L_1XT_1 (619.58 kg) followed by L_1XT_2 (602.12 kg). The lowest result was found in L_2XT_3 (461.81 kg) preceded by L_1XT_3 (482.25 kg). Interaction effect between locations, different types of seed treatments on 1000-seed weight were found no significant. The highest result was found in L_1XT_1 (3.28 gm) followed by L_1XT_2 and L_2XT_1 (3.25 gm). The lowest result was found in L_2XT_3 (3.16 gm) preceded by L_2XT_2 (3.19 gm) (Table 8).

Disease severity, seed yield, fibre yield and stick yield with seed treatments following line sowing method in the field

Relationship between disease severity and seed yield

Negative correlations were found between mean disease severity and seed yield in CVL-1 observed at both JAES and KRS of BJRI. Seed yield decreased with the increase of disease severity. The values of regression co-efficient (β) were -11.71 and -4.12 observed at JAES and KRS, respectively. The result indicated that increase of mean disease severity by 1% resulted corresponding decrease in seed yield by 11.71 kg/ha and 4.12 kg/ha at JAES and KRS, respectively (Fig. 1).

Relationship between disease severity and fibre yield

Negative correlations were found between mean disease severity and fibre yield in CVL-1 observed at both JAES and KRS of BJRI. Fibre yield decreased with the increase of disease severity. The values of regression co-efficient (β) were -0.13 and -0.06 observed at JAES and KRS, respectively. The result indicated that increase of mean disease severity by 1% resulted corresponding decrease in fibre yield by 0.13 ton/ha and 0.06 ton/ha at JAES and KRS, respectively (Fig. 2).

Relationship between disease severity and stick yield

Negative correlations were found between mean disease severity and stick yield in CVL-1 observed at both JAES and KRS of BJRI. Stick yield decreased with the increase of disease severity. The values of regression co-efficient (β) were -0.29 and -0.19 observed at JAES and KRS, respectively. The result indicated that increase of mean disease severity by 1% resulted corresponding decrease in stick yield by 0.29 ton/ha and 0.19 ton/ha at JAES and KRS, respectively (Fig. 3).

Therefore, the following conclusion may be drawn for quality seed and fibre production from the findings of this study:

➢ BAU- Biofungicide (3% of seed weight) can successfully be used for treating seeds to avoid Provax-200 for the production of quality healthy jute seeds with higher seed and fibre yield.

- Fibre and seed yield were found to decrease with the increase of seed borne infection of fungal pathogens.

So, the following recommendation may be drawn for quality seed and fibre production from the findings of this study:

- Seed treated of BAU- Biofungicide enhance the quality and yield of the jute seed and fibre in the field.

ACKNOWLEDGEMENT

The author first expresses his deep gratitude and gratefulness to his creator, the all mighty Allah for his kindness and giving ability to conduct and carry out this research work. Bangladesh Agricultural Research Council (BARC), Dhaka -1207 offered a NATP scholarship to study the research work with financial assistance.The author really grateful and indebted to BARC for this support.

LITERATURE CITED

Ahmed N, Islam N (1980). Correlation between jute seed infections recorded in the laboratory with the incidence diseases in the field. Ann. Rep. BJRI: 129-130.

Ahmed N, Sultana K (1985).Survey on the production and quality of jute seeds at Farm level. Ann. Rep. BJRI, Dhaka. 296-323

Ahmed QA (1966). Problems in jute plant pathology. Jute and Jute fabrics Pakistan, July: 184-186.

Ahmed QA (1968). Diseases of jute in East Pakistan,Jute and Jute Fab. Pak. 7:147-151.

Akanda MAM, Fakir GA (1985).Effect of seed dressing chemicals for the conterol of major seed borne pathogens of jute. Bangladesh J. Pl. Pathol. 1(11): 13-19.

Anonymous (2001). Control of insects and diseases of jute. Bangladesh Jute Res. Inst. Dhaka. 1-13.

Bangladesh Gazette (Additional) (December 20, 2010). 12.

BBS (2011). Statistical Year Book of Bangladesh. Bangladesh Bureau of Statistics, Planning Ministry, Dhaka.

Bhuiyan MAHB, Khokon MAR, Hossain I (2006).BAU-Biofungicide in controlling seedling diseases of winter vegetables. Bangladesh J.Plant Pathol. 22 (1&2): 1-5.

Biswas AC, Taher MA, Asaduzzaman M,Sultana K, Eshaque AKM (1985).Loss of yield and quality of jute fibre due to prevalence of stem rot, Bangladesh J. Plant Pathol. 1(1): 61-62.

Fakir GA (1989). Seed health test in seed quality control and seed certification. Seed Path. Lab. Pub. No. 4:11.

Fakir GA (1999). An annotated list of seed borne diseases in Bangladesh. Seed Paththology Laboratory, Dept. of Plant Pathology, BAU, Mymensingh: 7-8.

Fakir GA (2001). An annotated list of seed borne diseases in Bangladesh.Seed Pathology Laboratory, Dept. Plant Path. BAU, Mymensingh. 7-8.

Fakir GA, Islam MR (1990). Survey on the health status of jute and rice seeds of farmers of Sadar Upazilla, Mymensingh, BAURES progress.4: 42-47.

Fakir GA, Islam MR, Islam F (1993). Transmission of three major seed-borne fungal pathogens from seed to plant to seed in jute *Corchorus capsularis* L.) Abst. Progress in Plant Pathology. Proceedings of the 5th Biennial Conf.of Bangladesh Phytopath. Soc. 87.

Fakir GA, Sarder MA, Gaffar A, Ahmed MU (1991). An annotated list of important disorders of important crop plants of Bangladesh. Pl. Quarantine Rev. Prog. Sponsored by the Ministry of Agriculture in coordination with CIDA and DANIDA. 107.

Fazli SFI, Ahmed QA (1960). Fungus organisms associated with jute seeds and their effect on germinating seeds and seedlings. Agric.Pakistan. 11: 298-306.

Gomez AK, Gomez AA (1984). Statistical Procedures for Agric. Res. Second Edn. Intl . Rice Res. Inst. Manila, Philippines. 680.

Haque MM, Sultana K, Fakir GA (1999). Prevalence of major fungal pathogen in breeder seed, foundation seed, certified seed and farmers' seed of jute. Collaborative Research Report (BJRI and SPL). 11-16.

Hossain I (2011a). Troymashik Krishi Projuktii Barta. BAU Res. 3 (8): 13-15.

Hossain I(2003). Use of BAU-Biofungicide to control seed borne diseases of vegetables and pulses. Agril. Technologies Bangladesh Agricultural University, Mymensingh. 18.

Hossain I(2010). Environment friendly control of foot and root rot of lentil and chickpea in the field. BAU Res. Prog. 20:29.

Hossain I(2011b). BAU- Bio fungicide: Unique eco – friendly means and new dimension of plant disease control in Bangladesh. Lima Printing Press, Mymensingh. 07.

Hossain I, Sarkar SR (2008). Nursery diseases of mango and their management. Proce. of Bangladesh Agricultural University Research Progress. 19:37-38.

Hossain I, Yeasmin R, Hossain MM (2009).Management of seedling diseases of blackgram, mungben and lentil using BAU- Biofungicide, biofertilizer and cowdung. Eco-friendly Agril. J. 2 (11): 905-910.

Hossain MA, Talukder FAH, Islam M, Morshed G (1994). Studies on *C. olitorius* pipe-line varieties. Ann. Rep. Bangladesh Jute Res. Inst., Dhaka. 132-137.

Hossain S (2009). Efficacy of BAU-Biofungicide and fungicides in controlling leaf spot of wheat. An M. S. Thesis submitted to the Department of Plant Pathology, Bangladesh Agricultural University, Mymensingh.

IJSG website (2012-13). www.jute.org

Ikata S, Yoshida M (1940).A new anthracnose of jute plant. Annuals of Phytopath. Japan. 10: 141-149.

Islam MM (2007).About jute seed research. R.S. printing press, Kalwalapara, Mirpur-1,Dhaka-1216. 1.

Islam MM (2009). Jute seed technology.College gate binding and printing, Dhaka-1207. 89-97.

Islam N, Biswas AC (1981).Screening of seed dressing fungicides. Annual Report. 1981. BJRI.:218-219.

Islam, MM, Rahman M (2008). Hand book on Agricultural technology of jute, kenafand mesta crops. Bulbul printers, Dhaka-1203.27-28.

Khan AA, Fakir GA (1993). Association of seed borne pathogens with growing capsules and their entry into developing seeds in jute. Bangladesh J. Plant Pathol. 9 (1&2): 1-3.

Khandakar AL (1987). Jute seed at farm level. Bangladesh Agric. Res. Coun., Dhaka. 1-77.

Khandakar AL, Bradbeer JW (1983). Jute Seed Quality. Agric. Econ. and Social Sci. Prog. Bangladesh Agric. Res. Coun., Dhaka. 1-92.

Mostafa G (2009). Effect of BAU-Biofungicide in comparison with Bavistin and Amistar for controlling diseases of soybean variety G2. An M. S. Thesis submitted to the Department of Plant Pathology, Bangladesh Agricultural University, Mymensingh.

Shultana R, Hossain I, Ahmed S, Mamun MAA (2009). Efficacy of BAU- Biofungicide in controlling leaf spot of wheat (*Triticum aestivum*). Eco-friendly Agril. J. 2 (2): 392-395.

Yeasmin R, Hossain I, Hossain MM (2009). Management of seedling diseases of blackgram, mungbean and lentil using BAU- Biofungicide, biofertilizer and cowdung. Eco-friendly Agril. J. 2 (11): 905-910.